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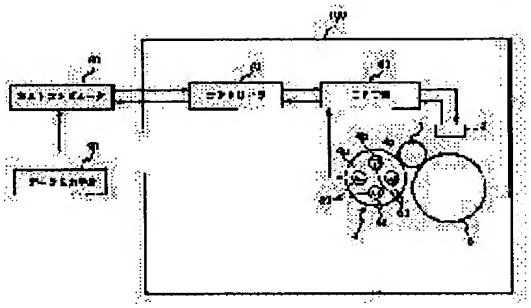
(54) MULTICOLOR IMAGE FORMING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To make possible an appropriate density control process matching changes in developing machine characteristic by providing a means adjusting the operating intervals of an image density adjustment means by consulting the total number of printed pages which is stored in a storage means.
SOLUTION: The number of printed pages is read from a nonvolatile memory 50 mounted in a developing machine 4 and is compared with the number of pages printed with the previous cartridge, which is stored in a CPU part 60. Even with the slightest difference from the previous information, a new cartridge is determined to have been inserted, and a density control process is performed immediately. When the numbers are coincident, after the number of printed pages is incremented for each color it is compared with a threshold used to determine whether or not the density control process should be executed and, if they are equal, the density control process is performed; i.e., the developing machine 4 has the nonvolatile memory 50, the number of printed pages which is stored in the nonvolatile memory 50 is read into the CPU part 60, and the CPU part 60 determines whether the condition of the developing machine 4 shows an early period, a stable period, or a degradation period, from the number of printed pages, and sets the intervals between the density control processes conforming to those conditions.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] Multi-colored picture image formation equipment which forms the color picture by two or more color toner by performing the development according to electrification, exposure, and two or more development counters to a sensitization medium, and the imprint to a picture support two or more times corresponding to the image information signal characterized by providing the following. A storage means for it to be prepared in the interior of each aforementioned development counter, and to memorize the total printing number of sheets. The density measurement means for measuring the concentration of the toner image for density measurement. A picture concentration adjustment means to control image formation conditions by the measurement result of this density measurement means. A means to adjust the interval of the aforementioned picture concentration adjustment means of operation with reference to the total printing number of sheets memorized by the aforementioned storage means.
[Claim 2] Multi-colored picture image formation equipment of the claim 1 characterized by performing density measurement of the toner image for density measurement on the aforementioned sensitization medium.
[Claim 3] The concentration of the aforementioned toner image for density measurement is multi-colored picture image formation equipment of the claim 2 characterized by being the relative concentration which removed the surface concentration of the aforementioned sensitization medium.
[Claim 4] Multi-colored picture image formation equipment of the claim 1 characterized by performing density measurement of the toner image for density measurement on the aforementioned picture support.
[Claim 5] Image formation equipment of the claim 1 characterized by having semiconductor laser as an image formation means.
[Claim 6] Image formation equipment of the claim 1 characterized by having Light Emitting Diode as an image formation means.
[Claim 7] A density measurement means is multi-colored picture image formation equipment of the claim 1 characterized by being a photo sensor containing a light emitting device and a photo detector.
[Claim 8] A color toner is multi-colored picture image formation equipment of the claim 1 characterized by being yellow, a Magenta, or a cyano toner.
[Claim 9] The aforementioned storage means is multi-colored picture image formation equipment of the claim 1 characterized by being non-volatile memory.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to multi-colored picture image formation equipments, such as an electrophotography method which uses the toner (developer) of two or more colors as a developer like a color copying machine or a color printer.
[0002]
[Description of the Prior Art] Hereafter, based on an accompanying drawing, an example of conventional multi-colored picture image formation equipment is explained. As shown in drawing 4 , multi-colored picture image formation equipment possesses the photoconductor drum 1 and the electrification machine 3 which are a sensitization medium, and is further supported with the base material 4 which two or more development counters 4a, 4b, 4c, and 4d can rotate by the left part of the photoconductor drum 1 in drawing. A photoconductor drum 1 is driven in the direction of an illustration arrow by non-illustrated driving means.
[0003] The laser diode (or Light Emitting Diode) 12 which constitutes an aligner above [in the main part of equipment], the polygon mirror 14 by which a rotation drive is carried out by the high-speed motor 13, a lens 15, and the clinch mirror 16 are arranged.
[0004] If the signal according to the picture pattern of yellow (it abbreviates to Y hereafter) is inputted into the above-mentioned laser diode 12, the optical information corresponding to yellow will be irradiated by the photoconductor drum 1 through an optical path 17, and a latent image will be formed. Furthermore, if a photoconductor drum 1 progresses in the direction of an arrow, this latent image will be visualized by development counter 4a. The toner image on a photoconductor drum 1 is imprinted on the middle imprint object 5 after that.
[0005] On the middle imprint object 5, the full color picture by the toner of two or more colors is formed by performing the above process one by one with a Magenta (it abbreviating to M hereafter), cyanogen (it abbreviating to C hereafter), and black (it abbreviating to B hereafter). Then, if the toner image of two or more colors on the middle imprint object 5 arrives at the imprint part which arranged the imprint electrification machine 6, the toner image on the middle imprint object 5 will be transferred to the imprint material 8 currently supplied to the imprint part side with the feed roller 7 by this time in this position. Furthermore, the imprint material 8 is conveyed by fixing equipment 9 through a transport device 7, by fixing equipment 9, melting fixing of the toner image of an imprint material front face is carried out, and a color picture is obtained.

[0006] On the other hand, the toner which remained on the photoconductor drum 1 is cleaned by the cleaning equipments 11, such as a fur brush and a blade means. Moreover, it is cleaned when the toner on the front face of the middle imprint object 5 is also ****(ed) by the cleaning equipments 10, such as a fur brush and a web.
[0007] By the way, if picture concentration is changed according to terms and conditions which use the multi-colored picture image formation equipment mentioned above, such as environment and print number of sheets, the right original color tone will no longer be acquired. In order to judge the situation of the picture at the time of image formation conventionally, then, the toner picture for each depth-of-shade detection to a photoconductor drum and picture support

(middle imprint object) top It formed (it is hereafter described as a patch) in a tentative way, the concentration was automatically detected by the concentration detection sensor 2, this detection result was fed back to image formation conditions, such as light exposure and development bias, that an original color picture should be formed, concentration control was performed and the stable picture had been acquired.
[0008] One of the work of this concentration control has the control which optimizes development bias, in order to obtain desired concentration in the environment of those days. Usually, although the relation between development bias and concentration is shown in the graph of drawing 5 , this curve C changes every moment that it is easy to be influenced of environmental variations, such as printing number of sheets, temperature, and humidity. Therefore, suitable printing number of sheets is set, and it creates, changing the patch picture development bias of several points, as shown in Va, Vb, Vc, and Vd, and the development bias which measures the concentration of the patch picture and can obtain the desired concentration D is presumed.
[0009] Moreover, printing number of sheets, concentration, and a relation are shown by the curve as shown in the graph of drawing 6 .
[0010] A patch is formed one by one from a picture beginning position so that the patch picture pattern used at this time may be represented by drawing 7 .
[0011]
[Problem(s) to be Solved by the Invention] However, although aging of the property of a development counter and a photo conductor is mentioned as one of the factors of picture concentration change in conventional multi-colored picture image formation equipment, the rate of the aging has the inclination which changes with use stages. Especially in the case of a development counter, it can divide roughly into three of stationary-phase and performance degradation terms the first stage.
[0012] It accustoms until a development counter demonstrates an original performance, and it is the stage when property change is the sharpest in these three periods in a period the first stage. Then, it goes into a stationary phase and property change becomes very loose. If use is furthermore repeated, the property deteriorates and change of picture concentration becomes large gradually. Although it is common to operate picture concentration automatic gears for every fixed printing number of sheets of a certain as timing which performs concentration control, when timing is set up according to an early development counter with a sharp concentration change, it becomes useless [the time for concentration control being performed more than required, when it goes into a stationary phase, and performing concentration control, and a toner], and a burden will be forced upon a user as a result.
[0013] Therefore, the main purposes of this invention are offering the image formation equipment in which suitable concentration control processing is possible corresponding to change of a development counter property.
[0014] Other purposes of this invention are offering the image formation equipment which can exclude the futility of the time in connection with concentration control processing, and a toner.
[0015]
[Means for Solving the Problem] The above-mentioned purpose is attained by the multi-colored picture image formation equipment concerning this invention. If it summarizes, this invention receives a sensitization medium corresponding to an image information signal. Electrification, In the multi-colored picture image formation equipment which forms the color picture by two or more color toner by performing exposure, the development by two or more development counters, and the imprint to a picture support two or more times A storage means for it to be prepared in the interior of each aforementioned development counter, and to memorize the total printing number of sheets, and the density measurement means for measuring the concentration of the toner image for density measurement, It is multi-colored picture image formation equipment characterized by having a picture concentration adjustment means to control image formation conditions by the measurement result of this density measurement means, and a means to adjust the interval of the aforementioned picture concentration adjustment means of operation with reference to the total printing number of sheets memorized by the

aforementioned storage means.
[0016] It is desirable to perform density measurement of the toner image for density measurement on the aforementioned sensitization medium. Preferably, the concentration of the aforementioned toner image for density measurement is the relative concentration which removed the surface concentration of the aforementioned sensitization medium. According to another mode, it is desirable to perform density measurement of the toner image for density measurement on the aforementioned picture support.
[0017] It is desirable to have semiconductor laser as an image formation means. According to another mode, it is desirable to have Light Emitting Diode as an image formation means.
[0018] As for a density measurement means, it is desirable that it is a photo sensor containing a light emitting device and a photo detector. As for a color toner, it is desirable that they are yellow, a Magenta, or a cyano toner. As for the aforementioned storage means, it is desirable that it is non-volatile memory.
[0019]
[Embodiments of the Invention] Hereafter, the multi-colored picture image formation equipment concerning this invention is **(ed) on a drawing, and is explained in more detail. In addition, this invention shall be embodied in the example explained below by the multi-colored picture image formation equipment shown in drawing 4 . Therefore, the detailed explanation about the overall composition of multi-colored picture image formation equipment and a function is omitted, and explains the feature section of this invention.
[0020] The block composition of the multi-colored picture image formation equipment in which one example of this invention is shown is shown in drawing 1 . In this drawing, multi-colored picture image formation equipment is equipped with the image processing system 100. in an image processing system 100 The communication from the photoconductor drum 1 which is a sensitization medium, development counters 4a-4d, the middle imprint object 5 which is a picture support, the concentration detection sensor 2 which is a density measurement means, the CPU section 60 which controls the above-mentioned composition member, and the host computer 80 of an external device is received. M, While transmitting the input data (the following, video data) which has 8-bit concentration information about four colors of C, Y, and Bk, it has the controller 70 which performs communications control of communicating a printer situation etc. to a host computer 80 in response to the signal from the CPU section 60. In addition, as for the input to a host computer 80, an operator is performed through the data input means 90.
[0021] The non-volatile memory 50 which is a storage means, respectively is carried in each development counters 4a-4d, and the total printing number of sheets is memorized. Thus, the main part of equipment can always grasp the printing number of sheets for every exact development counter by reading the printing number of sheets stored in non-volatile memory 50 though exchanged for example, in the middle of use in a development counter by carrying non-volatile memory 50 in each development counters 4a-4d.
[0022] Below, concentration control processing is explained. Although the pattern is the same on the middle imprint object 5 in drawing 2 , two or more patches 105A and 105B which the concentration difference has produced by changing development bias are created, and it is a beam of light IO from the light emitting device 101 of the concentration detection sensor 2 to the patches 105A and 105B. It irradiates and is the reflected light Ir. Light is received by the photo detector 102. Simultaneously, it is the light source light IO. And the reflected light Ir It measures by the concentration detection sensor 2, and incorporates in the CPU section 60 mentioned above.
[0023] Sensor output voltage is changed into concentration within CPU60, the patch concentration to each development bias at the time of the control execution is associated, the development bias which can obtain desired concentration is counted backward, and it is used as optimal development bias in the time till next concentration control processing. Thus, control for setting up the optimal development bias voltage is performed.
[0024] In addition, if the luminescence quantity of light decreases compared with an initial state by degradation of Light Emitting Diode which used the above-mentioned concentration detection sensor 2 as a light emitting device 101 or the measuring plane of a sensor 2 becomes dirty with

a toner, it will become difficult to maintain an early performance. Then, it sets to the predetermined value beforehand, surface the reflection factor to infrared light, i.e., optical reflection density, of the middle imprint object 5, the reflection density is measured periodically, and the sensor 2 is proofread.
[0025] Moreover, in forming a patch for example, on the photoconductor drum 1 using the photo conductor layer which consists of an organic photo conductor (OPC), the above-mentioned optical reflection density is the reflection factor of the under-coating layer contained in a photo conductor layer, it sets this optical reflection density to the predetermined value beforehand, measures the reflection density periodically, and proofreads a sensor. That is, a sensor measures the relative concentration of a patch which removed surface concentration as concentration of a patch.
[0026] Concentration control processing in this example is performed by the flow as shown in the flow chart of drawing 3 .
[0027] First, printing number of sheets is read from the non-volatile memory 50 carried in each color development counter 4 (S101), and it compares with the printing number of sheets of the cartridge at the time of the last printing memorized in the CPU section 60 of a main part, respectively (S102). If at least one differs from the information on the last, it will judge that the new cartridge was inserted and concentration control processing will be performed immediately (S104). the case of being altogether in agreement -- each of each color -- after incrementing printing number of sheets, when equal, concentration control processing is performed as compared with the threshold which judges execution of (S103) and concentration control processing (S105) (S106) When a threshold is larger than printing number of sheets, concentration control processing is not performed.
[0028] A new threshold is chosen when concentration control processing is ended (S107). Printing number of sheets is acquired about each cartridge of four colors, and the concentration control processing interval printing number of sheets corresponding to each printing number of sheets is computed. In it, it chooses as a threshold with the minimum new [several 00].
[0029] As mentioned above, the printing number of sheets by which each development counter carried non-volatile memory 50, and was stored in this non-volatile memory 50 is read into the CPU section 60, from the printing number of sheets for every read development counter, the CPU section 60 judges in any of a stationary-phase and performance degradation term the state of a development counter is the first stage, and the interval of the concentration control processing according to each state is set up.
[0030] An intense stage of concentration change, i.e., the first stage, and performance degradation term that is, by narrowing the interval which performs concentration control processing and performing it finely When it comes to be able to perform always suitable printing and the stage whose concentration change is quiet and is stable, i.e., a stationary phase, extends the interval which performs concentration control processing The number of times of concentration control processing can be decreased, and effects, such as a user's stress mitigation, can be expected by curtailment of the amount of waste toners, and shortening of print impossible time.
[0031]
[Effect of the Invention] A storage means according to this invention for it to be prepared in the interior of each development counter, and to memorize the total printing number of sheets so that clearly from the above explanation, The density measurement means for measuring the concentration of the toner image for density measurement, and a picture concentration adjustment means to control image formation conditions by the measurement result of this density measurement means, Corresponding to concentration change caused by aging of the property of a development counter, it becomes possible to perform concentration control processing to suitable timing by having a means to adjust the interval of the aforementioned picture concentration adjustment means of operation, with reference to the total printing number of sheets memorized by the aforementioned storage means. That is, concentration control processing is performed frequently at the intense stage of concentration change, and it becomes possible to print by the right concentration to each ****, and the interval which performs

concentration control processing is extended at the stage when printing transformation has a stable concentration change few, and it becomes that it is possible in stopping the loss of the time accompanying concentration control processing, and consumption of a toner as much as possible. If these things pull, they are connected to a user's profits.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing one example of the image formation equipment of this invention.
[Drawing 2] It is the block diagram showing the reflected type concentration sensor used by this example.
[Drawing 3] It is a flow chart for explaining this example.
[Drawing 4] It is the block diagram showing an example of conventional image formation equipment.
[Drawing 5] It is the graph which showed the development bias of a development counter, and the property of concentration.
[Drawing 6] It is the graph which shows aging of the picture concentration of a development counter.
[Drawing 7] It is the development showing an example of the patch picture formed in the middle imprint object.
[Description of Notations]
1 Photoconductor Drum (Sensitization Medium)
2 Concentration Detection Sensor (Density Measurement Means)
4 Development Counter
5 Middle Imprint Object (Picture Support)
50 Non-volatile Memory (Storage Means)
60 The CPU Section
70 Controller
105 Patch Picture

[Translation done.]

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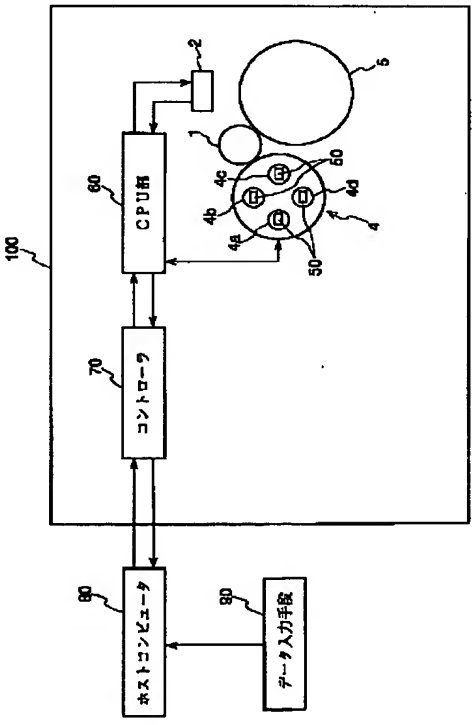
(54)【発明の名称】　多色画像形成装置

(57)【要約】

【課題】　現像器特性の変化に対応して適切な濃度処理制御を可能とし、該濃度処理に係る時間とトナーの無駄を省く。

【解決手段】　各現像器４ａ～４ｄに不揮発性メモリ５０を搭載し、印字枚数を格納する。ＣＰＵ部６０が、メモリ５０に格納された印字枚数により現像器４ａ～４ｄの初期、安定期、性能劣化期を判断し、中間転写体５に形成するパッチ画像の濃度測定等を含む濃度処理制御を実行する間隔を調整する。



【特許請求の範囲】
【請求項１】　画像情報信号に対応して、感光媒体に対して帯電、露光、複数の現像器による現像、及び画像担持体への転写を複数回行なうことによって複数色トナーによるカラー画像を形成する多色画像形成装置において、
前記各現像器内部に設けられ総印字枚数を記憶する記憶手段と、濃度測定用トナー像の濃度を測定するための濃度測定手段と、該濃度測定手段の測定結果により画像形成条件を制御する画像濃度調整手段と、前記記憶手段に記憶された総印字枚数を参照し、前記画像濃度調整手段の動作間隔を調整する手段とを有することを特徴とする多色画像形成装置。
【請求項２】　濃度測定用トナー像の濃度測定を前記感光媒体上で行なうことを特徴とする請求項１の多色画像形成装置。
【請求項３】　前記濃度測定用トナー像の濃度は、前記感光媒体の表面濃度を除去した相対濃度であることを特徴とする請求項２の多色画像形成装置。
【請求項４】　濃度測定用トナー像の濃度測定を前記画像担持体上で行なうことを特徴とする請求項１の多色画像形成装置。
【請求項５】　画像形成手段として半導体レーザを有することを特徴とする請求項１の画像形成装置。
【請求項６】　画像形成手段としてＬＥＤを有することを特徴とする請求項１の画像形成装置。
【請求項７】　濃度測定手段は、発光素子及び受光素子を含む光学センサであることを特徴とする請求項１の多色画像形成装置。
【請求項８】　カラートナーは、イエロー、マゼンタ、又はシアントナーであることを特徴とする請求項１の多色画像形成装置。
【請求項９】　前記記憶手段は、不揮発性メモリであることを特徴とする請求項１の多色画像形成装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、カラー複写機あるいはカラープリンター等のように現像剤として複数色のトナー（現像剤）を使用する電子写真方式等の多色画像形成装置に関する。
【０００２】
【従来の技術】以下、添付図面に基づいて従来の多色画像形成装置の一例について説明する。図４に示すように、多色画像形成装置は、感光媒体である感光ドラム１、帯電器３を具備し、更に図中感光ドラム１の左辺には、複数個の現像器４ａ、４ｂ、４ｃ、４ｄが回転可能な支持体４で担持されている。感光ドラム１は不図示の駆動手段によって図示矢印方向に駆動される。
【０００３】装置本体内の上方には、露光装置を構成するレーザーダイオード（又はＬＥＤ）１２、高速モーター１３によって回転駆動される多面鏡１４、レンズ１５、及び折り返しミラー１６が配置される。
【０００４】前述のレーザダイオード１２にイエロー（以下、Ｙと略す）の画像模様に従った信号が入力されると、光路１７を通ってイエローに対応した光情報が感光ドラム１に照射され、潜像が形成される。さらに、感光ドラム１が矢印方向に進むと、この潜像は現像器４ａによって可視化される。感光ドラム１上のトナー像は、その後、中間転写体５上に転写される。
【０００５】以上の工程をマゼンタ（以下、Ｍと略す）、シアン（以下、Ｃと略す）、ブラック（以下、Ｂと略す）と順次行なうことによって中間転写体５上には複数色のトナーによるフルカラー画像が形成される。その後、中間転写体５上の複数色のトナー像が転写帯電器６を配した転写部位に到来すると、この位置で中間転写体５上のトナー像は、このときまでに給紙ローラ７によって転写部位側に供給されている転写材８に転移する。更に転写材８は搬送装置７を介して定着装置９に搬送され、定着装置９によって転写材表面のトナー像は溶融固着されカラー画像が得られる。
【０００６】一方、感光ドラム１上に残留したトナーはファーブラシ、ブレード手段等のクリーニング装置１１によって清掃される。また中間転写体５の表面上のトナーもファーブラシ、ウエブ等のクリーニング装置１０によって摺擦されることにより清掃される。
【０００７】ところで、上述した多色画像形成装置は、使用する環境、プリント枚数等の諸条件によって画像濃度が変動すると、本来の正しい色調が得られなくなってしまう。そこで、従来、画像形成時における画像の状況を判断するため、感光ドラム上や画像担持体（中間転写体）上に各色濃度検知用のトナー画像（以下、パッチと記す）を試験的に形成し、その濃度を濃度検知センサ２によって自動的に検知し、この検知結果を露光量、現像バイアス等の画像形成条件にフィードバックし、本来のカラー画像を形成すべく濃度制御を行ない、安定した画像を得ていた。
【０００８】この濃度制御の作業の１つに、その当時の環境で所望の濃度を得るために現像バイアスを最適化する制御がある。通常、現像バイアスと濃度の関係は図５のグラフに示すようになっているが、この曲線Ｃが印字枚数、温度、湿度などの環境変化の影響を受け易く刻々と変化する。そのため、適当な印字枚数をおいて、数点のパッチ画像現像バイアスを例えばＶａ、Ｖｂ、Ｖｃ、Ｖｄに示すように変更しながら作成し、そのパッチ画像の濃度を測定して所望の濃度Ｄを得られる現像バイアスを推定する。
【０００９】又、印字枚数と濃度と関係は、図６のグラフに示すような曲線によって示される。
【００１０】このときに使用されるパッチ画像パターンは、図７に代表されるように、画像書き出し位置から順

次パッチが形成される。

【００１１】

【発明が解決しようとする課題】しかしながら、従来の多色画像形成装置において画像濃度変化の要因の一つとして、現像器、感光体の特性の経時変化が挙げられるのだが、その経時変化の割合は使用時期によって異なる傾向を持つ。特に現像器の場合は、初期、安定期、性能劣化期の３つに大別できる。

【００１２】初期は、現像器が本来の性能を発揮するまでのならし期間でこの３つの期間の中で最も特性変化が激しい時期である。その後、安定期に入り特性変化は非常に緩やかになる。さらに使用を重ねると特性が劣化していき、画像濃度の変化が徐々に大きくなっていく。濃度制御を行なうタイミングとしては、ある一定の印字枚数毎に画像濃度自動調整装置を動作させるのが一般的であるが、濃度変化の激しい初期の現像器に合わせてタイミングを設定すると、安定期に入ったときに必要以上に濃度制御を実行することになり、濃度制御を実行するための時間とトナーの無駄となり、結果としてユーザーに負担を強いることとなる。

【００１３】従って、本発明の主な目的は、現像器特性の変化に対応して適切な濃度制御処理が可能な画像形成装置を提供することである。

【００１４】本発明の他の目的は、濃度制御処理に関わる時間とトナーの無駄を省くことができる画像形成装置を提供することである。

【００１５】

【課題を解決するための手段】上記目的は本発明に係る多色画像形成装置にて達成される。要約すれば、本発明は、画像情報信号に対応して、感光媒体に対して帯電、露光、複数の現像器による現像、及び画像担持体への転写を複数回行なうことによって複数色トナーによるカラー画像を形成する多色画像形成装置において、前記各現像器内部に設けられ総印字枚数を記憶する記憶手段と、濃度測定用トナー像の濃度を測定するための濃度測定手段と、該濃度測定手段の測定結果により画像形成条件を制御する画像濃度調整手段と、前記記憶手段に記憶された総印字枚数を参照し、前記画像濃度調整手段の動作間隔を調整する手段とを有することを特徴とする多色画像形成装置である。

【００１６】濃度測定用トナー像の濃度測定を前記感光媒体上で行なうことが好ましい。好ましくは、前記濃度測定用トナー像の濃度は、前記感光媒体の表面濃度を除去した相対濃度である。別の態様によれば、濃度測定用トナー像の濃度測定を前記画像担持体上で行なうことが好ましい。

【００１７】画像形成手段として半導体レーザを有することが好ましい。別の態様によれば、画像形成手段としてＬＥＤを有することが好ましい。

【００１８】濃度測定手段は、発光素子及び受光素子を含む光学センサであることが好ましい。カラートナーは、イエロー、マゼンタ、又はシアントナーであることが好ましい。前記記憶手段は、不揮発性メモリであることが好ましい。

【００１９】

【発明の実施の形態】以下、本発明に係る多色画像形成装置を図面に則して更に詳しく説明する。尚、次に説明する実施例では、本発明は図４に示す多色画像形成装置に具現化されるものとする。従って、多色画像形成装置の全体的構成、機能についての詳しい説明は省略し、本発明の特徴部について説明する。

【００２０】図１には、本発明の一実施例を示す多色画像形成装置のブロック構成が示される。同図において、多色画像形成装置は画像処理装置１００を備えており、画像処理装置１００内には、感光媒体である感光ドラム１、現像器４ａ～４ｄ、画像担持体である中間転写体５、濃度測定手段である濃度検知センサ２、上記構成部材を制御するＣＰＵ部６０、外部装置のホストコンピュータ８０からの通信を受けてＭ、Ｃ、Ｙ、Ｂｋの４色について８ビットの濃度情報を持つ入力データ（以下、ビデオデータ）を転送すると共に、ＣＰＵ部６０からの信号を受けてホストコンピュータ８０にプリンタ状況などを通信するなどの通信制御を行なうコントローラ７０を備えている。尚、ホストコンピュータ８０に対する入力は操作者がデータ入力手段９０を介して行なわれる。

【００２１】各現像器４ａ～４ｄにはそれぞれ記憶手段である不揮発性メモリ５０が搭載され、総印字枚数が記憶される。このように各現像器４ａ～４ｄに不揮発性メモリ５０を搭載することにより、例えば、使用途中に現像器が交換されたとしても、不揮発性メモリ５０に格納されている印字枚数を読み込むことにより、装置本体は正確な現像器毎の印字枚数を常に把握できる。

【００２２】以下に、濃度制御処理について説明する。図２において、中間転写体５上にパターンは同一だが現像バイアスを変更することで濃度差が生じている複数個の例えばパッチ１０５Ａ、１０５Ｂを作成し、そのパッチ１０５Ａ、１０５Ｂに濃度検知センサ２の発光素子１０１から光線I_0を照射し、その反射光I_rを受光素子１０２で受光する。同時に、光源光I_0及び反射光I_rを濃度検知センサ２で測定し、上述したＣＰＵ部６０に取り込む。

【００２３】ＣＰＵ６０内でセンサ出力電圧を濃度に変換して、その制御実行時のそれぞれの現像バイアスに対するパッチ濃度を関連づけて、所望の濃度を得られる現像バイアスを逆算し、それをその時点での最適現像バイアスとして、次回の濃度制御処理時まで使用する。このようにして最適な現像バイアス電圧を設定するための制御を行なう。

【００２４】なお、上記濃度検知センサ２は、発光素子１０１として使用したＬＥＤ等の劣化により発光光量が

初期状態に比べて減少したり、センサ２の測定面がトナーによって汚れると、初期の性能を維持することが困難になる。そこで、中間転写体５の表面の赤外光に対する反射率、つまり光学反射濃度を予め所定の値に定めておき、その反射濃度を定期的に測定して、センサ２の校正を行なっている。

【００２５】又、パッチを例えば有機光導電体（ＯＰＣ）からなる感光体層を用いた感光ドラム１上に形成する場合には、上記光学反射濃度は、感光体層に含まれる下引き層の反射率であり、この光学反射濃度を予め所定の値に定めておき、その反射濃度を定期的に測定して、センサの校正を行なう。即ち、センサは、パッチの濃度として、表面濃度を除去したパッチの相対濃度を測定する。

【００２６】本実施例における濃度制御処理は、図３のフローチャートに示すような流れで行なわれる。

【００２７】まず、各色現像器４に搭載されている不揮発性メモリ５０より印字枚数を読み出し（Ｓ１０１）、本体のＣＰＵ部６０に記憶してある前回の印刷時のカートリッジの印字枚数と、それぞれ比較する（Ｓ１０２）。一つでも前回の情報と異なれば新しいカートリッジが挿入されたと判断して直ちに濃度制御処理を実行する（Ｓ１０４）。全て一致した場合には、各色それぞれ印字枚数をインクリメントした後に（Ｓ１０３）、濃度制御処理の実行を判断するしきい値と比較し（Ｓ１０５）、等しいときには濃度制御処理を実行する（Ｓ１０６）。しきい値が印字枚数より大きいときには濃度制御処理は行なわない。

【００２８】濃度制御処理を終了した際には、新たなしきい値の選択を行なう（Ｓ１０７）。４色のカートリッジそれぞれについて印字枚数を取得し、それぞれの印字枚数に対応した濃度制御処理インターバル印字枚数を算出する。その中で、最小の数時を新たなしきい値として選択する。

【００２９】上記のように、各現像器が不揮発性メモリ５０を搭載し、この不揮発性メモリ５０に格納された印字枚数をＣＰＵ部６０に読み込み、読み込んだ現像器毎の印字枚数から、現像器の状態が初期、安定期、性能劣化期のいずれに在るのかをＣＰＵ部６０が判断し、それぞれの状態に応じた濃度制御処理の間隔を設定する。

【００３０】つまり、濃度変化の激しい時期、即ち初期及び性能劣化期は濃度制御処理を行なう間隔を狭くしてきめ細かく行なうことにより、常に適切な印字ができるようになり、また、濃度変化が穏やかで安定している時期、即ち安定期は濃度制御処理を行なう間隔を広げることにより、濃度制御処理の回数を減少でき、廃トナー量の削減、また、プリント不可能時間の短縮によりユーザーのストレス軽減などの効果が期待できる。

【００３１】

【発明の効果】以上の説明から明らかなように、本発明によれば、各現像器内部に設けられ総印字枚数を記憶する記憶手段と、濃度測定用トナー像の濃度を測定するための濃度測定手段と、該濃度測定手段の測定結果により画像形成条件を制御する画像濃度調整手段と、前記記憶手段に記憶された総印字枚数を参照し、前記画像濃度調整手段の動作間隔を調整する手段とを有することにより、現像器の特性の経時変化により引き起こされる濃度変化に対応して、適切なタイミングで濃度制御処理を実行することが可能となる。即ち、濃度変化の激しい時期には濃度制御処理を頻繁に行ない、各色常に正しい濃度で印刷することが可能となり、濃度変化が少なく印字変質の安定している時期には濃度制御処理を行なう間隔を広げて、濃度制御処理に伴う時間のロスやトナーの消費を極力抑えることが可能となる。これらのことは、ひいては、ユーザーの利益へとつながる。

【図面の簡単な説明】

【図１】本発明の画像形成装置の一実施例を示すブロック図である。

【図２】本実施例で用いた反射型濃度センサを示す構成図である。

【図３】本実施例を説明するためのフローチャートである。

【図４】従来の画像形成装置の一例を示す構成図である。

【図５】現像器の現像バイアスと濃度の特性を示したグラフである。

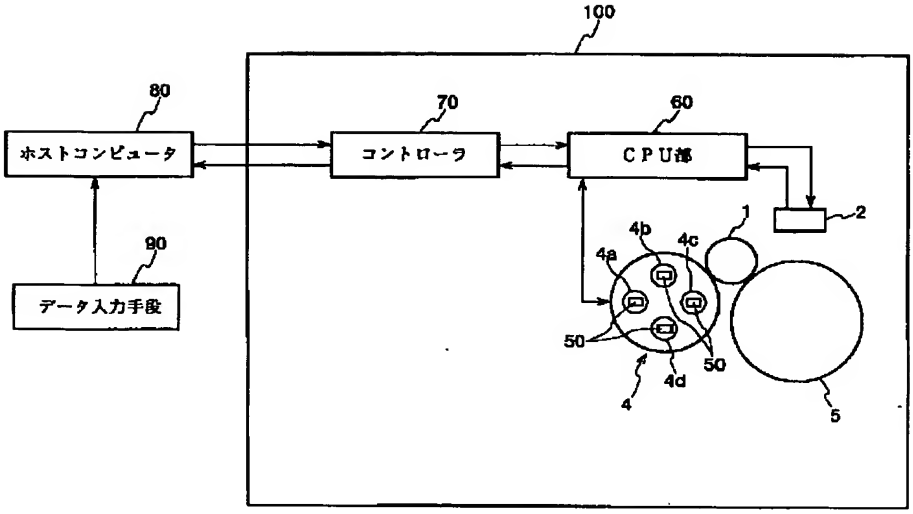
【図６】現像器の画像濃度の経時変化を示すグラフである。

【図７】中間転写体に形成したパッチ画像の一例を示す展開図である。

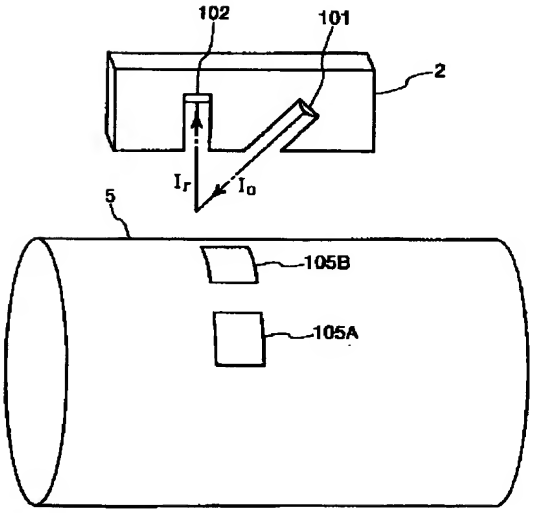
【符号の説明】

１	感光ドラム（感光媒体）
２	濃度検知センサ（濃度測定手段）
４	現像器
５	中間転写体（画像担持体）
５０	不揮発性メモリ（記憶手段）
６０	ＣＰＵ部
７０	コントローラ
１０５	パッチ画像

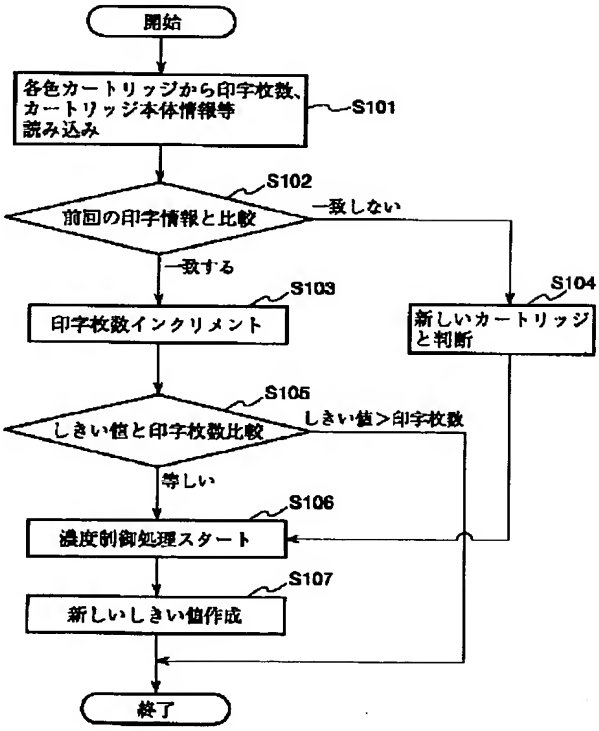
【図１】


100
80
ホストコンピュータ
70
コントローラ
60
CPU部
90
データ入力手段
1
2
4a
4b
4c
4d
4
5
50
50

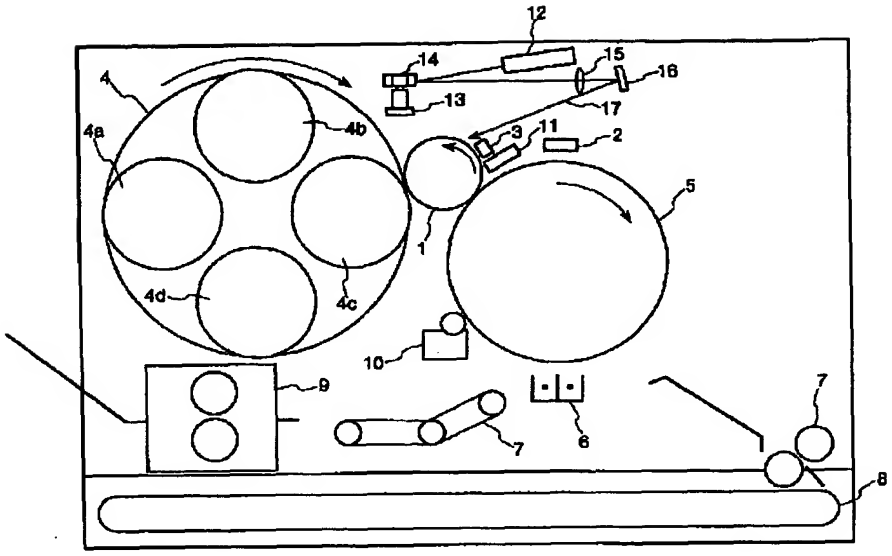
【図２】


102
101
2
I_r
I_0
5
105B
105A

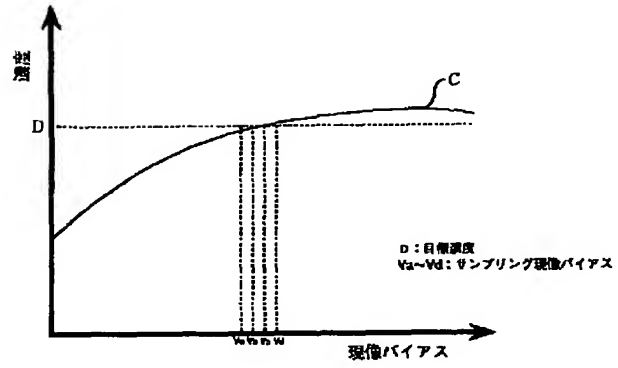
【図３】


開始
各色カートリッジから印字枚数、カートリッジ本体情報等読み込み
S101
S102
前回の印字情報と比較
一致しない
一致する
S103
印字枚数インクリメント
S104
新しいカートリッジと判断
S105
しきい値と印字枚数比較
しきい値＞印字枚数
等しい
S106
濃度制御処理スタート
S107
新しいしきい値作成
終了

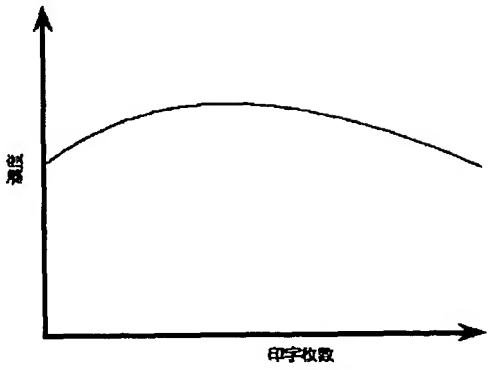
【図４】


12
14
15
16
4
13
17
4a
4b
3
11
2
5
1
4d
4c
10
9
7
6
7
8

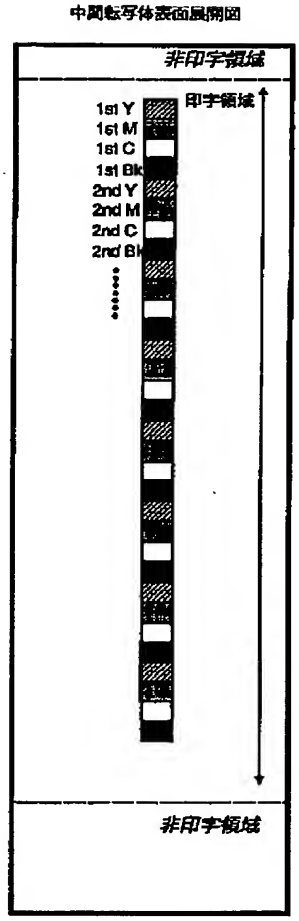
【図５】


濃度
C
D
現像バイアス

【図６】


濃度
印字枚数

【図７】


中間転写体表面展開図
非印字領域
印字領域
1st Y
1st M
1st C
1st Bk
2nd Y
2nd M
2nd C
2nd Bk
非印字領域